

European Respiratory Society Annual Congress 2013

Abstract Number: 1410

Publication Number: 1486

Abstract Group: 7.1. Paediatric Respiratory Physiology

Keyword 1: Exercise **Keyword 2:** Lung function testing **Keyword 3:** Children

Title: Gas exchange in health, lung disease and elite athletes: Diffusion capacity for carbon monoxide in children at rest and with exercise

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Body: Rationale: Decreased DLCO after exercise is reported in adults. There is limited information for post exercise DLCO available in children. Objectives: [1] Test reproducibility of DLCO in children, [2] compare DLCO between elite athletic swimmers [AS], stable cystic fibrosis patients [CF] and controls [Con] at rest & [3] after a maximal treadmill exercise test. Methods: 55 subjects (10 – 18 years) performed spirometry & DLCO at baseline, a maximal treadmill exercise test & repeated DLCOs for 2 hours post exercise. Results: [1] The mean [SD] co-efficient of variation between baseline DLCO tests was 2.49% [1.86%]. There was a uniformity of variance as the mean baseline DLCO rises [$r = -0.077$; $p=0.59$]. [2] AS had significantly larger FEV1% & FVC% compared to both CF & Con groups [$p<0.001$] & the Con group was significantly larger than the CF group [$p<0.001$]. AS had a higher baseline DLCO compared to CF & Con groups [$p<0.01$]. [3] There were no differences in mean decrease in DLCO from baseline between groups in girls, however male AS[-17.7%] were significantly different to CF[-6.92%] & Con[-9.23%][$P<0.05$]. Conclusions: DLCO is highly repeatable in children. AS have larger lung volumes, expiratory flows & an increased DLCO at rest compared to CF children & controls. Decline in post exercise DLCO & the pattern of change in DLCO after exercise is similar in children to adults.